OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **TUCKER POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. The 2000 average chlorophyll-a concentration was below the state mean reference line. Chlorophyll-a concentrations were elevated in May and September, but were at normal levels in July and August. Phosphorus concentrations were elevated in May and most likely caused an increase in algal growth, possibly a spring diatom bloom. In the September plankton sample, the blue-green alga *Microcystis* was the third most abundant algae. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable* trend in lake transparency. Mean transparency fell just below the New Hampshire mean reference line this season, but was consistent with the 1999 results. The water clarity in July was above the reference line, with low chlorophyll concentrations helping to increase the Secchi disk viewing in July and August. Water clarity in September decreased as the chlorophyll concentrations increased. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable* trend in the upper water layer, and a *slightly improving* trend in the lower water layer. Phosphorus concentrations were relatively stable throughout the summer in both layers. The increase in epilimnetic phosphorus concentrations in May was most likely caused by spring rains washing excess nutrients into the pond from the watershed. Mean hypolimnetic phosphorus concentrations have remained below the New Hampshire median for 12 years with the exception of the 1994 season. Mean epilimnetic phosphorus concentrations were back below the New Hampshire median, and have remained at or below the median for 11 years with the exception of the 1999 season. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- In 2000, small amounts of the blue-green alga *Microcystis* were observed in the plankton sample (Table 2). Blue-green algae can reach nuisance levels when sufficient nutrients and favorable environmental conditions are present. While overall algal abundance continues to be low in the lake, the presence of these indicator species should serve as a reminder of the lake's delicate balance. Continued care to protect the watershed by limiting or eliminating fertilizer use on lawns, keeping the lake shoreline natural, and properly maintaining septic systems and roads will keep algae populations in balance.

- Conductivity levels continue to be low throughout the Tucker Pond watershed (Table 6). This is an indication of good water quality, as conductivity measures the influence of human activities around a water body. Septic system leachate, agricultural runoff, iron deposits, and road runoff can each influence conductivity readings.

- Dissolved oxygen levels were again high throughout the water column (Table 9). The top 3 meters of the pond indicated super-saturated conditions, with percent saturation levels exceeding 100%. It is likely that there was a layer of plankton at these depths. Shallow ponds tend to mix continuously by wind and wave action, thereby allowing for oxygen exchange with the atmosphere.

NOTES

- Monitor's Note (5/29/00): Secchi might be low due to gray sky. Green algae growing in Inlet #2; this is unusual.

- Monitor's Note (7/23/00): Deadman's Inlet not flowing.

- Monitor's Note (9/12/00): Identified *Potamogeton* (pondweed)-sparse. Inlet #2 not flowing.

USEFUL RESOURCES

The Wetlands Resource, WD-WB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Lake Eutrophication, WD-BB-3, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

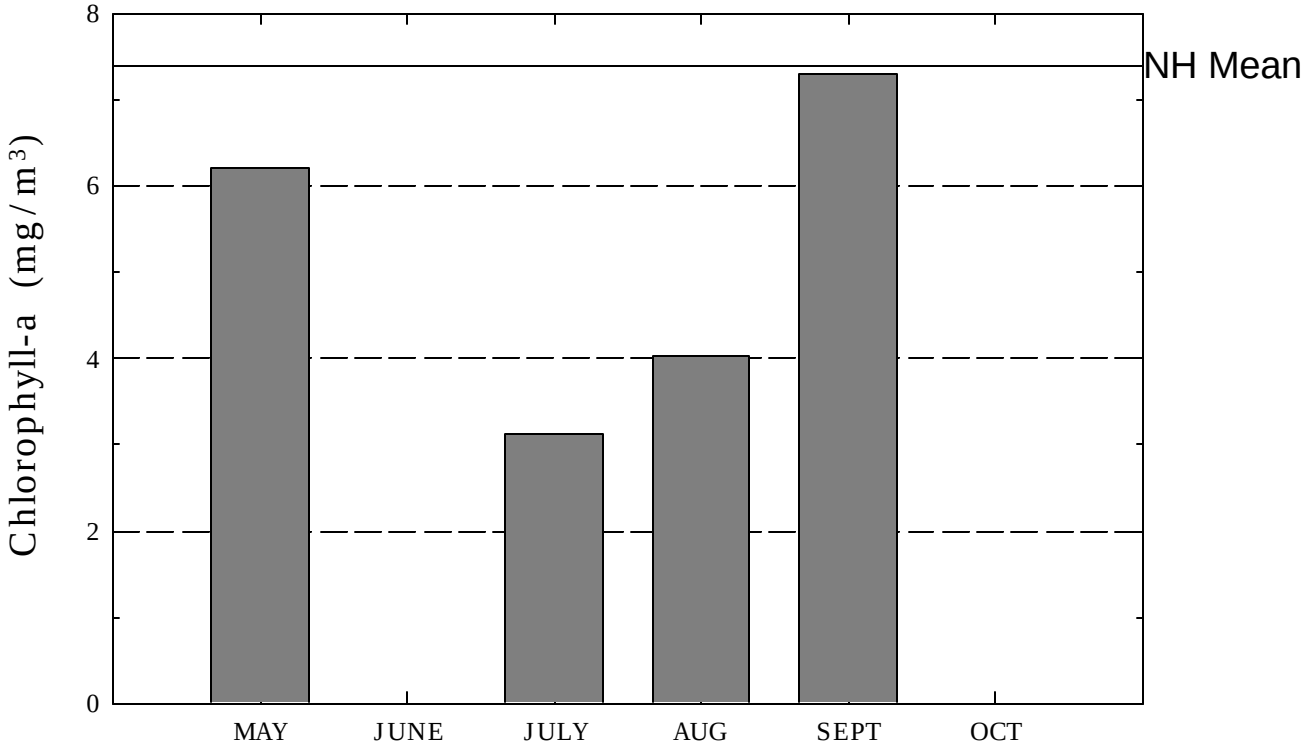
Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

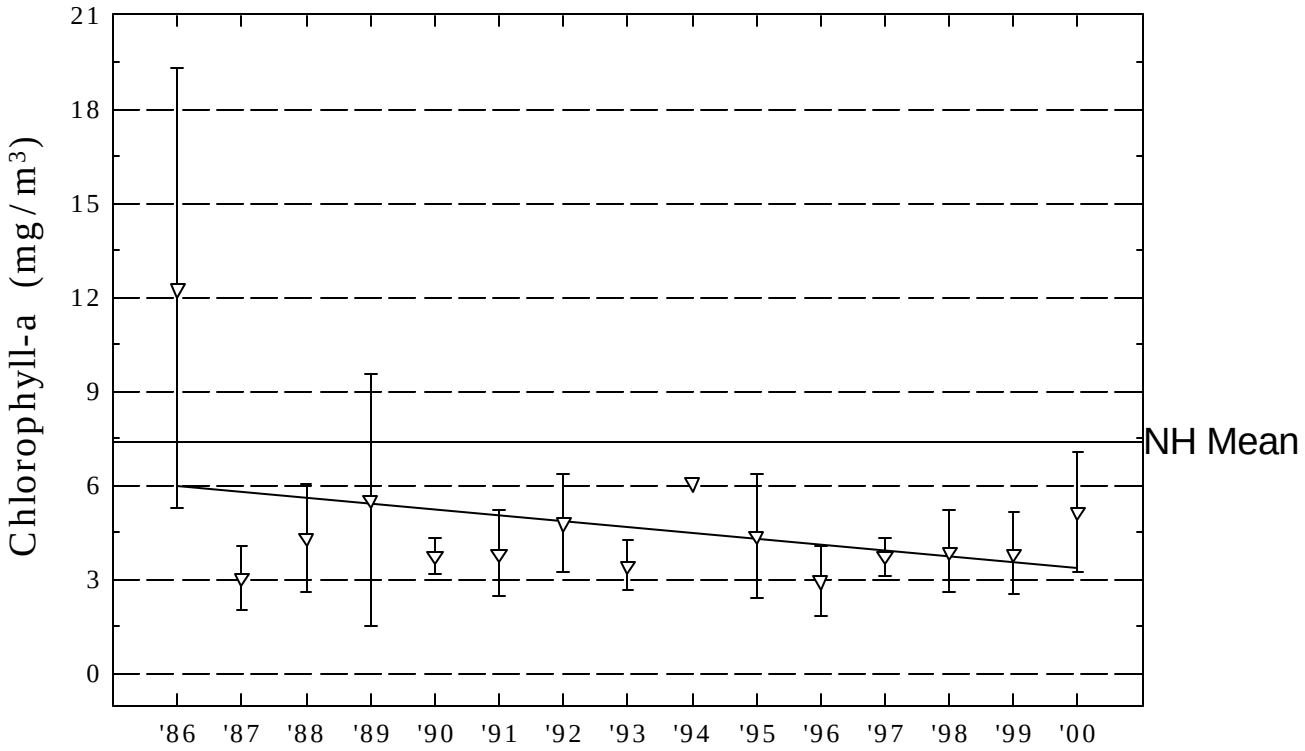
The Blue Green Algae. North American Lake Management Society, 1989. (608) 233-2836 or www.nalms.org

Tucker Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



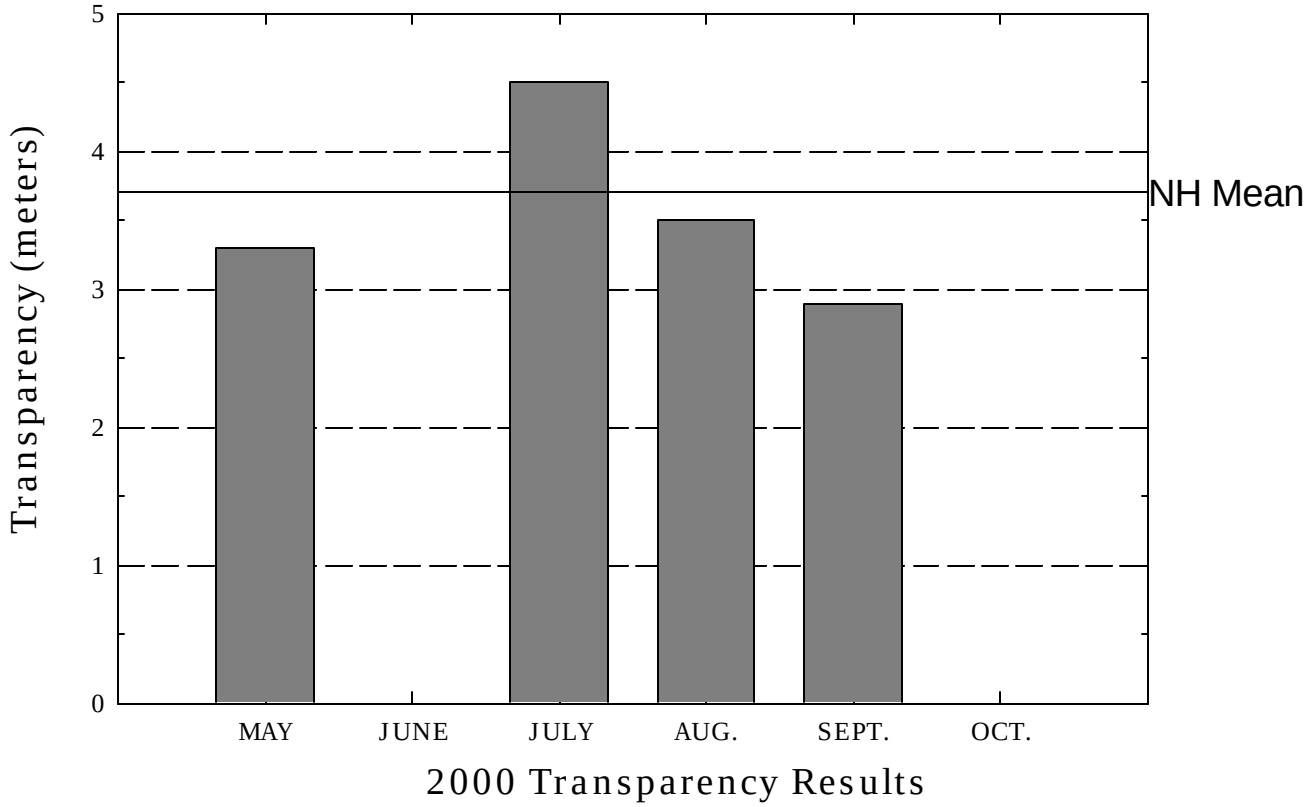
2000 Chlorophyll-a Results

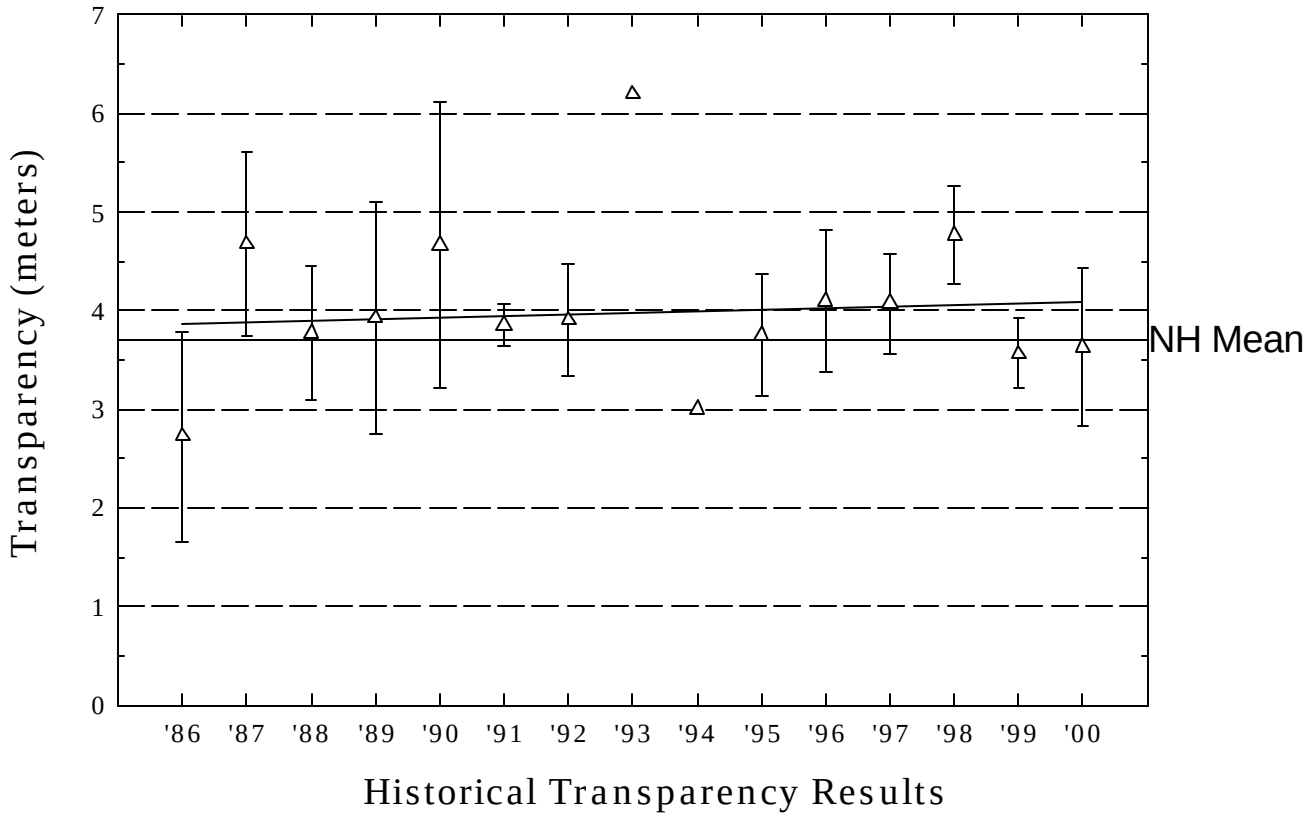


Historical Chlorophyll-a Results

Tucker Pond

Figure 2. Monthly and Historical Transparency Results





Tucker Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

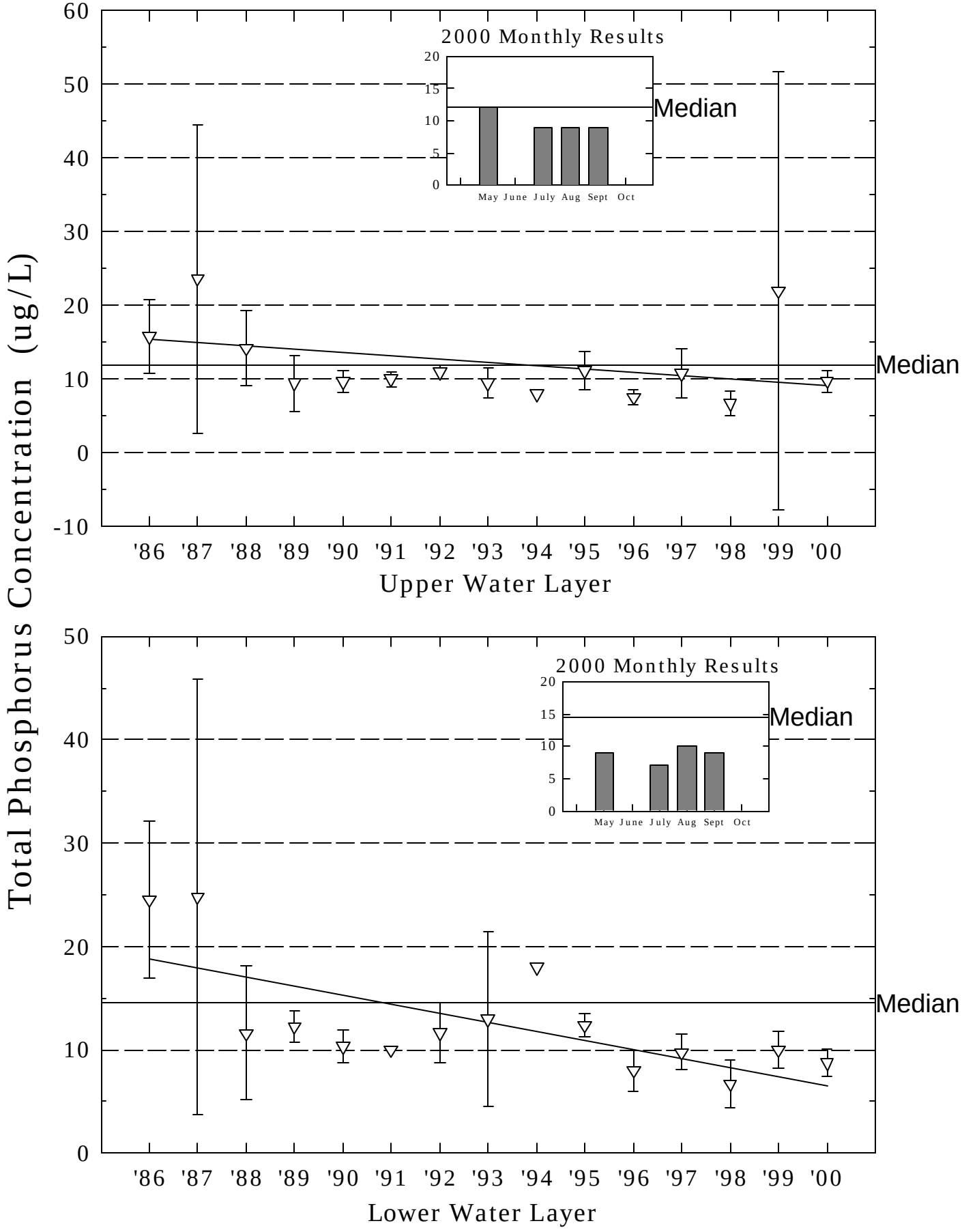


Table 1.

TUCKER POND

SALISBURY

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1986	2.59	19.08	12.27
1987	1.88	4.68	3.04
1988	2.51	7.05	4.33
1989	2.17	11.23	5.53
1990	3.20	4.32	3.74
1991	2.56	5.30	3.83
1992	3.25	6.40	4.79
1993	2.89	4.01	3.45
1994	6.09	6.09	6.09
1995	1.66	6.21	4.19
1996	1.64	4.05	2.95
1997	2.92	4.36	3.74
1998	2.56	5.69	3.68
1999	2.37	4.76	3.84
2000	3.13	7.29	5.16

Table 2.

TUCKER POND

SALISBURY

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08/24/1986	COELOSPHAERIUM	50
	DINOBRYON	28
09/28/1986	CHRYSOSPHAERELLA	93
07/15/1987	DINOBRYON	67
08/25/1988	UROGLENOPSIS	55
	MICROCYSTIS	40
07/13/1989	DINOBRYON	89
	TABELLARIA	
	COELOSPHAERIUM	
07/18/1990	ANABAENA	55
	COELOSPHAERIUM	34
09/06/1991	MICROCYSTIS	52
	COELOSPHAERIUM	23
	DINOBRYON	9
07/06/1992	DINOBRYON	64
	TABELLARIA	11
	CHRYSOSPHAERELLA	11
07/16/1993	COELOSPHAERIUM	47
	SYNURA	21
	RHIZOSOLENIA	20
07/08/1994	DINOBRYON	57
	SYNEDRA	24
	STAURASTRUM	17
06/16/1995	CHRYSOSPHAERELLA	69
	DINOBRYON	29
	TABELLARIA	2

Table 2.

TUCKER POND

SALISBURY

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/26/1996	MICROCYSTIS	50
	TABELLARIA	17
	STAURASTRUM	6
07/25/1997	CHRYSOSPHAERELLA	55
	DINOBRYON	26
	GYMNODINIUM	6
08/16/1998	CHRYSOSPHAERELLA	85
	DINOBRYON	7
09/09/1998	CHRYSOSPHAERELLA	85
	DINOBRYON	7
08/04/1999	CHRYSOSPHAERELLA	63
	RHIZOSOLENIA	17
	DINOBRYON	6
09/12/2000	RHIZOSOLENIA	56
	CHRYSOSPHAERELLA	20
	MICROCYSTIS	7

Table 3.

TUCKER POND

SALISBURY

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1986	1.9	4.2	2.7
1987	3.8	6.0	4.5
1988	3.1	4.5	3.7
1989	2.5	5.2	3.9
1990	3.3	6.2	4.6
1991	3.7	5.5	4.4
1992	3.5	4.5	4.1
1993	3.5	6.2	4.8
1994	3.0	3.0	3.0
1995	3.1	4.6	3.9
1996	3.5	4.9	4.1
1997	3.5	4.5	4.0
1998	4.0	5.3	4.4
1999	3.2	3.9	3.5
2000	2.9	4.5	3.5

Table 4.

TUCKER POND

SALISBURY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
DEAD MAN'S INLET				
	1995	6.22	6.66	6.46
	1996	6.08	6.51	6.20
	1997	6.30	6.35	6.32
	1998	6.00	6.45	6.27
	1999	6.19	6.64	6.33
	2000	6.45	6.57	6.50
EPILIMNION				
	1986	7.02	7.06	7.04
	1987	6.68	6.98	6.79
	1988	6.48	6.99	6.76
	1989	6.74	7.18	6.86
	1990	6.75	7.07	6.89
	1991	6.80	7.08	6.95
	1992	6.27	6.89	6.57
	1993	6.74	6.99	6.85
	1994	6.95	6.95	6.95
	1995	6.54	6.84	6.71
	1996	6.28	6.62	6.38
	1997	6.45	6.92	6.62
	1998	6.43	6.86	6.67
	1999	6.23	6.60	6.40
	2000	6.65	7.00	6.78

Table 4.

TUCKER POND

SALISBURY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1986	6.49	6.77	6.61
	1987	6.58	6.74	6.64
	1988	4.14	6.96	4.83
	1989	6.73	6.80	6.75
	1990	6.19	6.87	6.51
	1991	6.70	6.94	6.80
	1992	6.50	6.88	6.68
	1993	6.88	6.90	6.89
	1994	6.87	6.87	6.87
	1995	6.48	6.91	6.62
	1996	6.03	6.40	6.17
	1997	6.54	6.87	6.66
	1998	6.33	6.58	6.49
	1999	6.20	6.64	6.36
	2000	6.51	6.76	6.61
INLET #1				
	1986	6.44	6.57	6.50
	1987	6.35	6.53	6.45
	1988	6.33	6.60	6.46
	1989	6.30	6.63	6.43
	1990	6.42	6.60	6.52
	1991	6.63	6.63	6.63
	1992	6.50	6.52	6.51
	1993	6.43	6.43	6.43
	1995	6.33	6.67	6.54

Table 4.

TUCKER POND

SALISBURY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
INLET #1				
	1996	6.12	6.57	6.24
	1997	6.22	6.35	6.27
	1998	6.26	6.54	6.35
	1999	6.28	6.28	6.28
INLET #2 LOGGING				
	1987	6.38	6.50	6.46
	1988	6.40	6.42	6.41
	1989	6.16	6.60	6.40
	1990	6.31	6.59	6.48
	1991	6.56	6.90	6.70
	1992	6.43	6.45	6.44
	1993	6.39	6.39	6.39
	1995	6.61	6.61	6.61
	1997	6.54	6.54	6.54
	1999	6.45	6.45	6.45
	2000	6.40	6.53	6.47
METALIMNION				
	1992	6.48	6.48	6.48
	1993	6.80	6.80	6.80
	1994	6.92	6.92	6.92
OUTLET				
	1986	6.76	6.77	6.76
	1987	6.48	6.66	6.57
	1988	6.38	6.82	6.60

Table 4.

TUCKER POND

SALISBURY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1989	6.55	6.68	6.61
	1990	6.34	6.80	6.52
	1991	6.72	6.80	6.73
	1992	6.84	6.84	6.84
	1993	6.58	6.58	6.58
	1995	6.30	6.71	6.47
	1996	6.15	6.49	6.28
	1997	6.05	6.37	6.20
	1998	6.34	6.71	6.44
	1999	6.24	6.46	6.37
	2000	6.46	6.53	6.50

Table 5.

TUCKER POND

SALISBURY

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1987	4.60	4.70	4.65
1988	4.20	10.20	6.25
1989	3.80	4.40	4.10
1990	4.10	4.80	4.53
1991	4.00	9.10	6.03
1992	3.10	5.90	4.83
1993	4.00	5.90	4.95
1994	4.50	4.50	4.50
1995	3.30	5.40	4.24
1996	3.50	4.40	3.95
1997	3.10	3.90	3.45
1998	3.30	4.30	3.76
1999	3.10	4.50	3.83
2000	3.70	4.00	3.85

Table 6.

TUCKER POND
SALISBURY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
DEAD MAN'S INLET				
	1995	24.4	40.5	35.2
	1996	24.5	39.6	30.7
	1997	28.1	58.7	39.4
	1998	21.8	37.2	29.3
	1999	28.9	47.9	36.8
	2000	25.9	37.2	32.0
EPILIMNION				
	1986	26.2	27.3	26.8
	1987	23.7	25.4	24.4
	1988	23.4	26.1	25.0
	1989	24.9	25.9	25.3
	1990	24.8	29.5	26.5
	1991	25.3	25.6	25.4
	1992	27.3	28.6	28.1
	1993	24.4	27.8	26.1
	1994	28.2	28.2	28.2
	1995	29.5	30.3	29.8
	1996	28.1	30.8	29.7
	1997	26.1	26.6	26.4
	1998	26.6	28.2	27.1
	1999	29.4	32.0	31.0
	2000	30.6	31.2	31.0

Table 6.

TUCKER POND
SALISBURY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1986	27.7	40.4	34.0
	1987	23.4	25.7	24.4
	1988	23.5	62.6	32.1
	1989	25.4	26.1	25.8
	1990	24.7	26.7	25.7
	1991	23.8	25.9	25.2
	1992	27.1	27.7	27.5
	1993	22.4	27.8	25.1
	1994	28.8	28.8	28.8
	1995	29.7	31.2	30.1
	1996	28.4	30.2	29.5
	1997	26.4	26.8	26.6
	1998	25.7	27.8	27.0
	1999	29.0	31.9	30.8
	2000	30.5	31.3	30.9
INLET #1				
	1986	29.8	30.0	29.9
	1987	25.0	28.4	26.4
	1988	24.5	29.3	26.6
	1989	24.1	32.5	28.6
	1990	24.5	40.0	30.2
	1991	27.8	27.8	27.8
	1992	26.3	27.5	26.9
	1993	24.0	24.0	24.0

Table 6.

TUCKER POND
SALISBURY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1995	23.7	48.0	35.9
	1996	25.6	46.7	32.3
	1997	27.2	39.3	32.8
	1998	20.7	46.3	33.8
	1999	24.7	24.7	24.7
INLET #2 LOGGING				
	1987	25.1	29.4	26.8
	1988	25.9	27.8	26.7
	1989	26.3	31.9	29.0
	1990	24.9	38.2	30.0
	1991	27.9	38.2	33.0
	1992	26.2	28.9	27.5
	1993	22.0	22.0	22.0
	1995	28.1	28.1	28.1
	1997	48.1	48.1	48.1
	1999	44.6	44.6	44.6
	2000	23.2	39.9	31.2
METALIMNION				
	1992	27.3	28.4	27.8
	1993	23.6	23.6	23.6
	1994	28.2	28.2	28.2
OUTLET				
	1986	25.8	28.2	27.0
	1987	23.8	25.3	24.4
	1988	23.1	28.3	25.4

Table 6.

TUCKER POND
SALISBURY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1989	25.5	26.3	25.8
	1990	25.0	30.3	26.9
	1991	24.9	25.5	25.0
	1992	27.0	28.5	27.7
	1993	22.2	22.2	22.2
	1995	29.0	35.8	31.2
	1996	27.3	30.5	29.0
	1997	26.2	27.7	26.7
	1998	26.9	27.5	27.2
	1999	25.5	32.0	29.5
	2000	30.5	31.1	30.8

Table 8.

TUCKER POND

SALISBURY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
DEAD MAN'S INLET				
	1995	1	8	5
	1996	6	35	14
	1997	4	10	6
	1998	6	28	16
	1999	5	19	10
	2000	5	9	7
EPILIMNION				
	1986	12	23	15
	1987	6	55	23
	1988	8	22	14
	1989	7	15	9
	1990	8	11	9
	1991	9	11	10
	1992	10	12	11
	1993	8	11	9
	1994	8	8	8
	1995	8	15	11
	1996	6	8	7
	1997	7	14	10
	1998	5	9	6
	1999	1	56	22
	2000	9	12	9

Table 8.

TUCKER POND

SALISBURY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1986	15	32	24
	1987	8	60	24
	1988	3	21	11
	1989	11	14	12
	1990	9	12	10
	1991	10	10	10
	1992	10	15	11
	1993	7	19	13
	1994	18	18	18
	1995	11	14	12
	1996	5	9	8
	1997	8	12	9
	1998	1	8	5
	1999	8	11	10
	2000	7	10	8
INLET #1				
	1986	5	142	52
	1987	3	52	17
	1988	5	30	18
	1989	9	118	43
	1990	5	25	13
	1991	19	19	19
	1992	9	14	11
	1993	5	5	5

Table 8.

TUCKER POND

SALISBURY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1995	3	21	11
	1996	8	115	43
	1997	8	27	14
	1998	7	11	9
	1999	9	9	9
INLET #2 LOGGING				
	1987	5	46	18
	1988	3	12	8
	1989	6	34	16
	1990	3	13	8
	1991	21	26	23
	1992	6	34	20
	1993	7	7	7
	1995	3	3	3
	1997	15	15	15
	1999	11	11	11
	2000	5	7	6
METALIMNION				
	1992	9	9	9
	1993	13	13	13
	1994	18	18	18
OUTLET				
	1986	9	13	11
	1987	5	53	21
	1988	8	19	12

Table 8.

TUCKER POND

SALISBURY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1989	7	16	12
	1990	8	14	11
	1991	10	12	11
	1992	8	11	9
	1995	10	21	14
	1996	4	12	8
	1997	6	12	9
	1998	6	8	6
	1999	6	13	9
	2000	5	10	7

Table 9.

TUCKER POND

SALISBURY

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		September 12, 2000	
0.1	20.2	6.7	73.9
1.0	20.6	8.2	91.2
2.0	21.1	8.6	96.8
3.0	21.7	8.9	101.5
4.0	21.7	8.9	101.1
5.0	21.8	8.9	101.6
5.5	21.8	9.0	102.7

Table 10.

TUCKER POND

SALISBURY

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 15, 1987	7.0	10.5	6.5	57.0
August 25, 1988	6.5	17.0	0.5	9.0
July 13, 1989	5.0	17.3	8.8	90.0
July 18, 1990	6.0	16.5	11.9	122.2
September 6, 1991	6.5	21.1	3.0	33.9
July 6, 1992	6.5	13.0	10.5	99.6
July 16, 1993	6.0	18.5	9.3	98.0
July 8, 1994	4.0	24.9	5.7	67.0
May 12, 1995	5.0	11.6	10.2	92.0
May 12, 1995	5.5	11.5	9.6	86.0
July 26, 1996	4.5	21.2	5.4	60.0
July 25, 1997	5.0	21.3	8.0	88.0
September 9, 1998	6.0	18.2	1.2	13.0
August 4, 1999	6.0	18.4	5.2	55.3
September 12, 2000	5.5	21.8	9.0	102.7

Table 11.

TUCKER POND
SALISBURY

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
DEAD MAN'S INLET				
	1997	0.1	0.8	0.4
	1998	0.2	1.6	0.8
	1999	0.2	2.5	1.2
	2000	0.1	0.1	0.1
EPILIMNION				
	1997	0.3	0.5	0.4
	1998	0.4	26.7	5.8
	1999	0.5	0.6	0.6
	2000	0.4	0.7	0.5
HYPOLIMNION				
	1997	0.4	0.5	0.5
	1998	0.4	27.0	5.9
	1999	0.7	0.8	0.7
	2000	0.5	0.5	0.5
INLET #1				
	1997	0.1	0.3	0.2
	1998	0.1	0.5	0.3
	1999	0.5	0.5	0.5
INLET #2 LOGGING				
	1997	0.2	0.2	0.2
	1999	0.1	0.1	0.1
	2000	0.0	0.2	0.1
OUTLET				
	1997	0.4	0.6	0.5

Table 11.

TUCKER POND

SALISBURY

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1998	0.4	0.8	0.6
	1999	0.4	1.9	0.9
	2000	0.4	0.6	0.5